

The University of Iowa

Report to the Legislature on Technology Transfer and Economic Development (TTED) FY 2001

**Submitted to the
Board of Regents,
State of Iowa**

October 2001

UNIVERSITY OF IOWA
Report to the Legislature on
Technology Transfer and Economic Development
October 2001

Executive Summary

The UI experienced a successful year in FY 2001, extending or maintaining its various technology transfer activities during a period of economic slowdown and UI budget constraints. Corporate sponsored research at The University of Iowa in FY 2001 was \$26.8 million, bringing the five-year total industrial research support to \$145.5 million. It represented 9.6 percent of the \$277.9 million in external support reported by the University during the year. The University Division of Sponsored Programs (DSP) and the Clinical Trials Office successfully negotiated 307 corporate research agreements in FY 2001, bringing the five-year total of corporate research agreements to 1,469.

The University of Iowa Research Foundation (UIRF) maintained a high level of activity during FY 2001. The UIRF received 65 new invention disclosures, filed 73 U.S. patent applications, received a record high 43 issued patents, executed a record high 31 license and option agreements, and earned \$4,496,246 in royalty/license fee income (see report for details and trends). Importantly, the UIRF hired a new licensing associate and a second full-time support staff member, and began a search for a third licensing associate to fill a new position created in FY 2001 due to the growing UIRF technology portfolio.

The Office of Research Marketing and Corporate Relations (RMCR) developed a statewide corporate outreach program to foster new and creative linkages with Iowa companies and economic development agencies to match business needs with UI capabilities in a variety of fields. During the first full year of this function in FY 2001, RMCR staff undertook 36 on-site visits to Iowa companies and hosted 12 campus visits. These visits as well as outreach presentations by RMCR staff strive to : (a) showcase UI technology transfer programs, (b) facilitate alliances across a wide range of organizations to address complex issues such as workforce development and training in high-tech sectors and (c) feature examples of how UI's partnerships with industry and our community enhance Iowa's economic vitality and quality of life.

The Technology Innovation Center (TIC) accepted four new tenant firms in FY 2001. It also successfully graduated one company and reported 15 tenants occupying 100 percent of available laboratory space and the vast majority of available office space. As part of a plan to address a shortage of flexible wet lab space for start-up biotech companies, the UI committed institutional funds to construct a building shell in FY 2001 and the Iowa Department of Economic Development accepted the Oakdale Research Park as recipient of a \$500,000 Advanced Research Commercialization (ARC) award that will be used to build out laboratory space for the TIC incubator in FY 2002. The College of Medicine and the Center for Biocatalysis and Bioprocessing continued to provide short-term assignment of lab space for three biotech start-ups.

The Oakdale Research Park (ORP) experienced continued growth in FY 2001. Nine R & D companies had a presence on the ORP. A major new addition to the UI Multi-Tenant Facility will provide corporate-funded academic research space as well as flexible wet laboratory research space for start-up companies in the TIC business incubator. The Biocatalysis Division of Albany Molecular Research, Inc. expanded into its new \$3.5 million wet laboratory facility. In FY 2001, NCS Pearson committed to be the anchor tenant of a \$4 million complex that will open on the Park in early FY 2002. As FY 2001 ended, research staff of the National Advanced Driving Simulator (NADS) neared completion of a detailed checklist of systems and equipment prior to placing the NADS in operation.

UNIVERSITY OF IOWA
Technology Transfer Highlights
July 2000 – June 2001

This report presents some highlights of University of Iowa technology transfer activities in FY 2001. These and other activities are included in the University's Report to the Legislature on Technology Transfer and Economic Development.

These highlights reflect technology transfer activities that are consistent with the University's strategic plan and the vision and goals of *Iowa 2010* to encourage "new economy" growth in the high technology areas of Information Solutions, Advanced Manufacturing, and Life Sciences.

Corporate Research Funding and University Inventions

Important Corporate Funding and Research Agreements – University of Iowa faculty continued their remarkable record of success in industrial research support and corporate research agreements. In FY 2001 UI faculty attracted \$26.8 million in corporate sponsored research funding for a total of \$145.5 million in corporate research grants and contracts over the past five years. Industrial research funding represented 9.6 percent of a record \$277.9 million in external support that the University attracted from all sources in FY 2001. The University's Division of Sponsored Programs and the Clinical Trials Office successfully negotiated 307 corporate research agreements in FY 2001. In just the past five years, the UI has successfully negotiated 1,469 corporate research agreements.

Issued Patents, Executed Licenses Set Records – FY 2001 was another productive year for intellectual property management at the University. The University of Iowa Research Foundation received 65 new invention disclosures from faculty and staff, filed 73 U.S. patent applications, received 43 issued patents, executed 31 license and option agreements, and earned \$4,496,246 in royalty and license income. The 43 issued patents and 31 executed license and option agreements were annual record high totals.

CMV Promoter – Among the most prominent technology transfer successes at The University of Iowa is the patented CMV Promoter for Increased Protein Expression. The significance of the CMV promoter was discovered in the laboratory of Mark F. Stinski, UI Professor of Microbiology, in his study of gene regulation mechanisms in the CMV virus. The CMV promoter has now become a very widely used tool in the biotechnology industry. It has gained importance in the commercial setting to manufacture bioengineered drugs, and may enable the development of gene therapy and DNA vaccine products. Several CMV-based drugs have received FDA approval and are currently being used to treat patients with cancer and other diseases. At the end of FY 2001, the UIRF had negotiated non-exclusive licenses for use of the CMV promoter with 57 industrial partners, up from 45 licenses at the end of FY 2000.

Coley Pharmaceutical Group – Beginning in the mid-1990s The University of Iowa Research Foundation filed patent applications on inventions made by Arthur Krieg, UI Professor of Internal Medicine, which offer the prospect for the creation of novel therapies for the treatment and prevention of diseases by activating innate or acquired immune responses. The UIRF licensed the early discoveries in 1997, and now holds a substantial portfolio of patents and patent applications which are licensed to Coley Pharmaceutical Group, a company founded on the base UIRF technology. From this portfolio, five significant U.S. patents were awarded to the UIRF in FY 2001, including two covering fundamental aspects of Krieg's work. Coley Pharmaceuticals Group has four pharmaceuticals based on UIRF technologies that are in preclinical and clinical development for various disease indications. Currently

nine clinical trials are underway, including Phase II clinical trials in the areas of cancer, asthma/allergy, and infectious diseases.

Licensure of Platform Gene Therapy Technologies – In FY 2001 The University of Iowa Research Foundation executed a license agreement with Targeted Genetics Corporation of Seattle for use of certain gene therapy platform technologies developed at the UI in the Laboratory of John Englehardt, UI Associate Professor of Anatomy and Cell Biology, and Internal Medicine, and Director of the UI Center for Gene Therapy of Cystic Fibrosis and Other Genetic Diseases. The license provides Targeted Genetics Corporation with access to technological developments which may expand the use of adeno-associated virus (AAV) as a vector for delivery of genes to cells missing specific genes or containing defective genes. The technologies developed by Englehardt and his colleagues offer the potential to overcome the size limitation imposed by a single AAV vector, and increase the efficacy by which genes are delivered from the cell surface to the cell nucleus.

Spin-Off Companies – The University of Iowa Research Foundation participates in creating “spin-off” companies by licensing inventions resulting from research in UI laboratories back to the new start-up firms, which then seek to develop and commercialize the technology. FY 2001 highlights involving several UI spin-off companies and other affiliates of the Technology Innovation Center business incubator and UI Oakdale Research Park are noted in the following section.

Business Incubator and Oakdale Research Park

TIC Incubator Graduate Expands – UI biotech spin-off company and TIC graduate Integrated DNA Technologies, Inc. celebrated further expansion in FY 2001. Founded by former UI biochemistry professor Joseph A. Walder, Integrated DNA completed a \$1.6 million expansion of its research and production facility in Coralville to 45,000 square-feet and 280 employees. The firm is one of the world's leading suppliers of custom oligonucleotide synthesis and a leading developer of new biological materials.

Read All About It – UI spin-off company and TIC graduate Breakthrough to Literacy, Inc. continued to grow, with 65 employees at its Oakdale Research Park headquarters and 82 other staff in 39 states. In FY 2001, Breakthrough, a leading developer of interactive literacy programs, was in more than 5,000 classrooms and was helping more than 90,000 children around the country to be skilled readers. The company was founded by Carolyn Brown, who received her Ph.D. in speech pathology and audiology from the UI. In early FY 2002, Brown and her husband, Dr. Gerald Zimmerman, Breakthrough president and co-founder, were scheduled to present the Breakthrough to Literacy process at a U.S. Senate subcommittee hearing on education and technology.

Honors – Two TIC incubator graduates, Buckle Down Publishing Company and Breakthrough to Literacy, Inc., received FY 2001 economic development awards from the Iowa City Area Chamber of Commerce, becoming the fourth and fifth TIC graduate firms to be so honored.

New Biotech Facility – The Biocatalysis Division of Albany Molecular Research, Inc. (AMRI) celebrated the completion of a new \$3.5 million, 10,000 square-foot biotechnology laboratory facility on the Oakdale Research Park in FY 2001. The AMRI Division was formerly known as EnzyMed, Inc., a UI spin-off company and TIC incubator tenant. AMRI, headquartered in Albany, NY chose to invest in the Iowa facility and continue the close relationship between AMRI and the UI Center for Biocatalysis and Bioprocessing laboratory nearby on the Park.

Welcome to NCS Pearson – In FY 2001 local development group TMD, LLC began construction of Corridor Technology Center, a three-building, \$4 million, 67,500 square-foot project that will welcome NCS Pearson as anchor tenant in mid-FY 2002. NCS Pearson is a provider of applications, services and technologies for educational testing, assessment and complex data management. The assessment division, originally established as Measurement Research Corporation, was an early spin-off from research activities in the UI College of Education. NCS Pearson has a major corporate presence in Iowa City and another facility in Cedar Rapids. The new project on the Park will house software development and project management activities.

Incubator Wet Labs – Responding to an urgent need at The University of Iowa, the Iowa Department of Economic Development approved a \$500,000 Advanced Research Commercialization (ARC) award to the UI Oakdale Research Park in FY 2001. In making this award, the Iowa DED stepped forward to enable the University to address a critical shortage of laboratories for lease to small life science firms seeking to grow in the State. The funds will be used to construct and equip much-needed wet lab space for biotech start-up companies in the UI TIC business incubator. The shortage of flexible wet lab space has constrained the ability of the TIC to serve the needs of new biotech companies. The project was expected to be completed in FY 2002.

Spin-Off Acquisition – TIC tenant and UI spin-off company Quorum Sciences, Inc. was acquired by Aurora Biosciences Corporation of San Diego in FY 2001. Now known as the Microbiology Department of Aurora Biosciences Corp., the Iowa unit was enabled to expand its business and research prospects while remaining in Iowa. Aurora's Iowa-based unit is a biomedical research company dedicated to developing technology in the area of chemical signaling in bacteria. The pioneering research work of the founder, E. Peter Greenberg, UI professor of microbiology, was profiled in the August 14, 2000 issue of U.S. News & World Report.

Virtually Being There – TIC tenant Digital Artefacts, LLC earned widespread recognition in FY 2001 for its role in creating the real-time, interactive virtual environment project called "This Old Digital City" for the History Center of Cedar Rapids. The 3D simulation offers a 180-degree virtual reality model of a 25-square-block area of Cedar Rapids as it appeared in 1900. Company representatives were also invited to make a presentation to senior staff of the Smithsonian Museum in Washington, D.C. Digital Artefacts, an information visualization developer, was founded by a UI undergraduate, graduate student, and professor.

Incubator News – The TIC incubator accepted four new tenant companies in FY 2001. They are AudioNet International, LLC; Selim Laboratories, Inc.; Essential Science; and Human Capital Company. One tenant, CompuTerra, Inc., "graduated" from TIC to the Oakdale Research Park. All five companies counted UI faculty, staff, undergraduates or graduate students among their founders.

The Numbers Game – At the end of FY 2001, 34 companies had a presence on the Oakdale Research Park, were tenants of the Technology Innovation Center business incubator, or were TIC graduates. Those companies, along with the four Oakdale-sited anchor laboratories, reported 942 total employees including 121 post-graduate fellows, graduate students, and undergraduates. This represents a gain of 193 (+26 percent) from FY 2000 and an increase of 359 (+62 percent) from FY 1999.

Statewide Outreach to Iowa Corporations/Economic Development Agencies

Matching Iowa Companies With UI Capabilities - Beginning in July 2000, the UI Office of Research Marketing and Corporate Relations initiated a statewide corporate outreach effort with a view to systematically undertake up to 35 on-site visits annually to Iowa companies to match business needs with capabilities within The University of Iowa. Viewing the UI role as an enthusiastic statewide partner in economic development, the Office launched alliance mechanisms to bring together a larger number of varied constituencies to more effectively address complex issues in workforce training and skills development in technology sectors, student co-ops and internships, and technology transfer.

Aiding Workforce Development - The Office of Research Marketing and Corporate Relations strengthened working relationships with University Career Development and placement staff, Iowa companies, and the statewide Iowa Human Resource Recruitment Consortium (Iowa HRRC) established by Governor Vilsack to increase the number of internships and employment opportunities offered by Iowa life science companies. In FY 2001 the Office worked with the University Alumni Association to invite UI alumni who had left the State to a series of Governor's receptions around the country. The Office assisted UI placement offices in organizing campus visits for Iowa companies and participated in the Board of Regents Job Fair. A senior UI Career Services officer was appointed to the Iowa Workforce Development Board of Directors in FY 2001. She collaborated with Office of Research Marketing and Corporate Relations staff in working with the Iowa HRRC to identify new and more effective ways in which Iowa job opportunities could be promoted and highlighted to students attending universities and colleges in Iowa. One of the productive new UI/HRRC initiatives in FY 2001 was to share resumes of Iowa college graduates with TIC incubator and Oakdale Research Park companies. The director of the John Pappajohn Entrepreneurial Center at the University was appointed to the Board of Directors of Software and Information Technology Industries of Iowa, an association dedicated to growing this "new economy" industrial field in Iowa. RMCR Director was appointed to the Iowa Economic Development Board in FY 2001. She participated in the Workforce Development Public Policy Forum organized by the Iowa Association of Business and Industry (ABI).

Promoting visibility for and accessibility to UI resources and creating new linkages with State constituencies

During FY 2001, RMCR hosted 12 campus visits for corporate and economic development agency executives. RMCR Director made two joint outreach presentations along with ISU and UNI to emphasize the accessibility of resources at the Regents institutions. RMCR Director also undertook a pilot project along with colleagues at Drake University and Kirkwood Community College to propose a cost-effective way in which the State (IDED) might consider marketing Iowa by enhancing web presence of Iowa's higher education resources on IDED's website. These visits as well as outreach presentations by RMCR staff strive to : (a) showcase UI technology transfer programs, (b) facilitate alliances across a wide range of organizations to address complex issues such as workforce development and training in high-tech sectors and (c) feature examples of how UI's partnerships with industry and our community enhance Iowa's economic vitality and quality of life.

THE UNIVERSITY OF IOWA
Report to the Legislature on
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Introduction and Strategic Links

The University of Iowa submits the following report on activities related to technology transfer and economic development. Without exception the activities for technology transfer and economic development are consistent with the **University Mission Statement** which says:

"The University of Iowa seeks to advance scholarly and creative endeavor through leading-edge research and artistic production; to use this research and creativity to enhance undergraduate, graduate, and professional education, health care, and other services provided to the people of Iowa, the nation, and the world; and to conduct these activities in a culturally diverse, humane, technologically advanced, and increasingly global environment."

The technology transfer and economic development programs addressed in this report are inextricably linked to **New Century Iowa: Bridges to the Next Horizon, a Strategic Plan for The University of Iowa 2000-2005**. The activities described here directly follow and support the achievement of the following Strategic Goal:

Goal 3: To foster distinguished research, scholarship and artistic creation.

- *Create an intellectual environment that supports the exchange and critical analysis of ideas.*
- *Cultivate a distinguished and diverse research community of scholars that activity involves undergraduates as well as graduate students.*
- *Accelerate enhancements to infrastructures supporting research, scholarship, and creative activities in selected areas of strength and promote opportunities for increasing external funding in all areas.*
- *Promote the role of the University in technology transfer and economic development*

The report is based on strategic plans drafted by the relevant program units reporting to the UI Vice President for Research. These units include the Oakdale Research Park (ORP), Technology Innovation Center (TIC), University of Iowa Research Foundation (UIRF), Office of Research Marketing and Corporate Relations (RMCR), and Division of Sponsored Programs (DSP). Also included here is information from three State-funded laboratories established as part of an earlier University strategic planning initiative. They are the Center for Advanced Drug Development (CADD), Center for Biocatalysis and Bioprocessing (CBB), and National Advanced Driving Simulator (NADS).

Program Activity: Research Park

The Oakdale Research Park strives to increase the academic vitality of the UI by fostering private sector relations with the University by attracting businesses with potential links to the University to the Park. Corporate locations on the Park increase the economic vitality of the region and State. The Park emphasizes such fields as pharmaceuticals, industrial biotechnology, health and medical sciences, and computer simulation of complex systems.

In FY 2001 the Park continued to build a nucleus of businesses in Iowa that are drawn by the research strengths of the University. This is in keeping with the University strategic plan to reach out to external constituencies and to participate in Iowa's economic growth in fields that are congruent with the State's targeted cluster areas of life science, information science and advanced manufacturing.

- Capital projects representing an investment of nearly \$15 million for nearly 108,000 square-feet of laboratory and office space were under construction on the Park in FY 2001.
 - *The largest project is Corridor Technology Center, a \$4 million complex of three buildings that will total 67,500 square-feet. The anchor tenant is NCS Pearson, which will locate an expanding software development unit and program managers on the Park. The 37,500 square-foot Phase I will be occupied by mid-FY 2002.
 - *A major biotechnology industry expansion on the Park in FY 2001 was a 10,000 square-foot, \$3.5 million laboratory facility for the Biocatalysis Division of Albany Molecular Research, Inc. (AMRI). The new laboratory was constructed in the privately-owned Myriad Technology Plaza complex, and represents a commitment by New York-based AMRI to expand its biocatalysis division in Iowa. The division, the UI spinoff company formerly known as EnzyMed, Inc., was acquired by AMRI in late 1999.
 - *Construction of a 30,000 square-foot addition to the UI Multi-Tenant Facility, a life science laboratory building owned by the University Facilities Corporation, was started in FY 2001. The project includes a 15,000 square-foot laboratory funded by corporate research contracts and a 15,000 square-foot building shell for future University research needs. Importantly, in FY 2001 the Iowa Department of Economic Development awarded a \$500,000 Advanced Research Commercialization (ARC) grant to the Park for construction of laboratories and associated office space in part of the shell. When completed in FY 2002, the laboratories will be leased to startup biotechnology companies admitted to the UI Technology Innovation Center business incubator, a close affiliate of the Park.
- Nine companies had a presence on the Park at the end of FY 2001. New tenants during the year were the AMRI Biocatalysis Division and CompuTerra, an environmental engineering and software development company that graduated from the TIC business incubator.
- In addition to the AMRI Biocatalysis Division, Park companies experiencing significant growth in FY 2001 were Breakthrough to Literacy, Inc. and Stockpoint, Inc., both graduates of the TIC incubator. Breakthrough was recognized as one of the nation's leading developers and providers of literacy programs, serving 90,000 children in 39 states. Breakthrough had 147 employees nationwide including 65 in Iowa. The company received an economic development award for its achievements from the Iowa City Area Chamber of Commerce in FY 2001.
- In FY 2001 artificial intelligence software developer Stockpoint, Inc. became the largest company on the Park with 117 employees. It was acquired by ScreamingMedia of New York, a leading Internet content provider, in a July 2001 transaction valued at \$21.6 million. This acquisition will be discussed in greater detail in the FY 2002 report.
- Total employment on the Park in FY 2001 was 495, an increase of 46 or nearly 10 percent from the FY 2000 total of 449. The total employment figure includes 87 students, interns and post-graduate fellows employed at the nine private companies on the Park and four University anchor laboratories at Oakdale. Total employment on the Park was 352 in FY 1999 when the first annual survey was undertaken.

- Seven of the nine Park companies volunteered salary information for this report. Average annual salary figures were provided for all full-time employees and for newly-hired employees with a four-year college degree. The average salary for all full-time employees in FY 2001 was \$50,786, while the average salary for a new college graduate hired by a Park company in FY 2001 was \$41,857. This was the second year that companies were asked to provide average salary figures. In FY 2000 the average was \$60,158 for all employees and \$37,500 for new college graduates.
- In FY 2001 Park staff participated in briefings and offered tours to Governor Vilsack, Congressmen Leach and Boswell, and C.J. Niles, director of the Iowa Department of Economic Development. Congressman Leach was featured speaker at a public event celebrating the opening of the AMRI Biocatalysis Division laboratory. Park staff led a tour for a delegation from the Iowa Area Development Group and participated in planning an August 2001 program and laboratory tour for U.S. Senator Charles Grassley and up to 100 ambassadors and other diplomats [details will be presented in the FY 2002 report]. The Park co-sponsored the University's participation in the 2001 BIO Conference in Seattle, a joint initiative with the Iowa Department of Economic Development, the Iowa Biotechnology Association, Iowa State University and the University of Northern Iowa. Park staff served on the board of the Iowa City Area Development Group and Area Chamber of Commerce economic growth committees. The Iowa DED presented Park staff with a da Vinci Award for economic leadership in 2001.

FY 2001 activities of the state-funded anchor laboratories sited at Oakdale are discussed in the appendix to this report.

Program Activity: Business Incubator

The Technology Innovation Center (TIC) is a business incubator which provides space and a range of services to new commercial enterprises using advanced technology. Its tenants include start-up companies spun off from UI research activities. The TIC is closely affiliated with the Oakdale Research Park.

- The TIC ended FY 2001 with 15 tenant companies and 17 "graduate" firms which succeeded in meeting their business goals upon leaving the TIC incubator. During the year one company, CompuTerra, Inc., graduated from the incubator and moved to the Oakdale Research Park. Four new tenants were admitted to the TIC in FY 2001. They are AudioNet International, LLC; Selim Laboratories, Inc.; Essential Science; and Human Capital Company. It should be noted that UI faculty, staff, and graduate students were among the founders of all four new tenants as well as the graduating firm.
- Another UI spin-off company, the Biocatalysis Division of Albany Molecular Research, Inc. (AMRI), continued as a TIC tenant in biotechnology laboratory space made available by agreement with the UI Center for Biocatalysis and Bioprocessing. The AMRI division, formerly known as EnzyMed, Inc., also completed a major expansion to a new biotechnology laboratory facility on the Park. "Business Week" magazine picked AMRI as #7 on its list of the nation's top 100 growth companies.
- TIC tenant and UI spin-off company Quorum Sciences, Inc. was acquired by Aurora Biosciences Corporation of San Diego, CA in FY 2001. The acquisition enabled Quorum, now known as the Microbiology Department of Aurora Biosciences Corp., to further expand its business and research

prospects while remaining in Iowa. The Microbiology Department of Aurora expanded its TIC laboratory and office space and activities in FY 2001, made possible by cooperation with the UI College of Medicine and the Oakdale Medical Research anchor laboratory. Importantly, the company will further expand its Iowa presence in FY 2002 when new, much-needed TIC incubator laboratory space is completed in an addition to the UI Multi-Tenant Facility. The new TIC laboratories will be substantially funded by a \$500,000 Advanced Research Commercialization award from the Iowa Department of Economic Development in FY 2001 [this project is reported in the Oakdale Research Park section above].

- Historically, TIC affiliate companies have leveraged more than \$20 in non-state investment for each \$1 of state funds to support the TIC incubator.
- In FY 2001 TIC tenant The Patient Education Institute announced an agreement with the National Library of Medicine (NLM) to offer customized interactive multimedia patient education programs on the NLM website for consumer health information. The user-friendly programs of animated graphics, narration, and interactive questions with feedback have been available to medical patients in hospitals and clinics since 1995.
- TIC company Digital Artefacts, LLC, an information visualization developer, earned recognition in FY 2001 for its role in creating the real-time, interactive virtual environment project called "This Old Digital City" for the History Center of Cedar Rapids. The 3D simulation offers a 180-degree virtual reality model of a 25-square-block area of Cedar Rapids as it appeared in 1900. Digital Artefacts was founded by a UI graduate student, professor, and undergraduate student.
- Several incubator "graduate" companies reported achievements in FY 2001. The growth of TIC graduates on the Park, including Breakthrough to Literacy, Inc., and Stockpoint, Inc. was discussed in the Oakdale Research Park section.
- Buckle Down Publishing Company, a leading educational publisher located in Iowa City, expanded its staff to 56 and was honored with an economic development award by the Iowa City Area Chamber of Commerce. Buckle Down was founded by former staff of ACT, an early UI spin-off company.
- Breakthrough to Literacy, Inc. expanded its research-based literacy programs to serve 90,000 children in 39 states. Breakthrough reported 147 total employees including 65 locally at its headquarters facility on the Oakdale Research Park. The company received an economic development award from the Iowa City Area Chamber of Commerce for its achievements, the fifth TIC graduate to be so honored by the Area Chamber [the TIC was recognized by the Area Chamber for an award in 1995].
- Total employment among 15 TIC tenant companies at the end of FY 2001 was 77, including ten students. The TIC total was down from 89 in FY 2000 and 120 in FY 1999, primarily due to the graduation of five TIC tenants over those two years and shifting of most AMRI employees from its TIC laboratory to a Park facility. Among TIC graduate firms, total employment in FY 2001 was 652, including 53 students. The total represented an increase of 211 or 48 percent from FY 2000 (441 employees) and an increase of 327 or 101 percent from FY 1999 (325 employees), the first year of the TIC employment survey.

- Twelve of the 15 TIC companies volunteered salary information for this report. The average (mean) salary reported for all full-time employees in FY 2001 was \$47,337, compared to \$48,367 in FY 2000. The average salary for new full-time employees with a four-year college degree in FY 2001 was \$34,167, compared to \$33,000 in FY 2000.
- Nine of the 17 TIC graduate companies volunteered salary information for this report. The average (mean) salary reported for all full-time employees in FY 2001 was \$43,944, compared to \$45,000 in FY 2000. The average salary reported for new full-time employees with a four-year college degree in FY 2001 was \$35,556, compared to \$37,500 in FY 2000.
- The TIC strengthened its working relationship with the UI Small Business Development Center (SBDC) and John Pappajohn Entrepreneurial Center (JPEC). Staff of those programs continued to assist the TIC with application reviews, and one start-up company mentored by JPEC was accepted as an incubator tenant. The TIC arranged a program of tenant company tours for a JPEC summer entrepreneurial youth camp, encouraged TIC tenants to participate in SBDC and JPEC training programs, and arranged for the SBDC and JPEC to establish a part-time office presence at Oakdale in order to be more accessible to technology companies in the TIC incubator, on the Park, and elsewhere in the Coralville/North Liberty corridor.
- TIC staff also met with representatives of venture firms, angel investors and financial institutions and in selected cases helped arrange introductions and presentations involving TIC affiliates. Among the firms meeting with TIC staff were Equity Dynamics, Cybus Markets, Arch Development, David Wilhelm Consultants, Dain Raucher, and Iowa Area Development Group.
- Improved telecommunication infrastructure was installed in the TIC building in FY 2001 as part of the campus fiber optic network project. As a result, TIC tenant companies have access to faster Internet connectivity and telecommunication service that is more versatile and reliable. This infrastructure project addressed a leading concern of TIC tenants engaged in software development and Internet commerce.
- In cooperation with staff of the University of Iowa Research Foundation and Research Marketing and Corporate Relations, TIC and ORP staff collaborated with a website developer in the Research Office to create a totally new web presence for the TIC incubator and the other units [<http://www.vpr.uiowa.edu/techtransfer/>].

Key findings from the FY 2001 employment survey of TIC business incubator and Oakdale Research Park affiliates are reported below. Also provided here are graphic presentations of employment trends for FY 1999, 2000 and 2001.

ANNUAL EMPLOYMENT AND SALARY REPORT
Technology Innovation Center (TIC)/
Oakdale Research Park (ORP)
FY 2001

Employment Totals

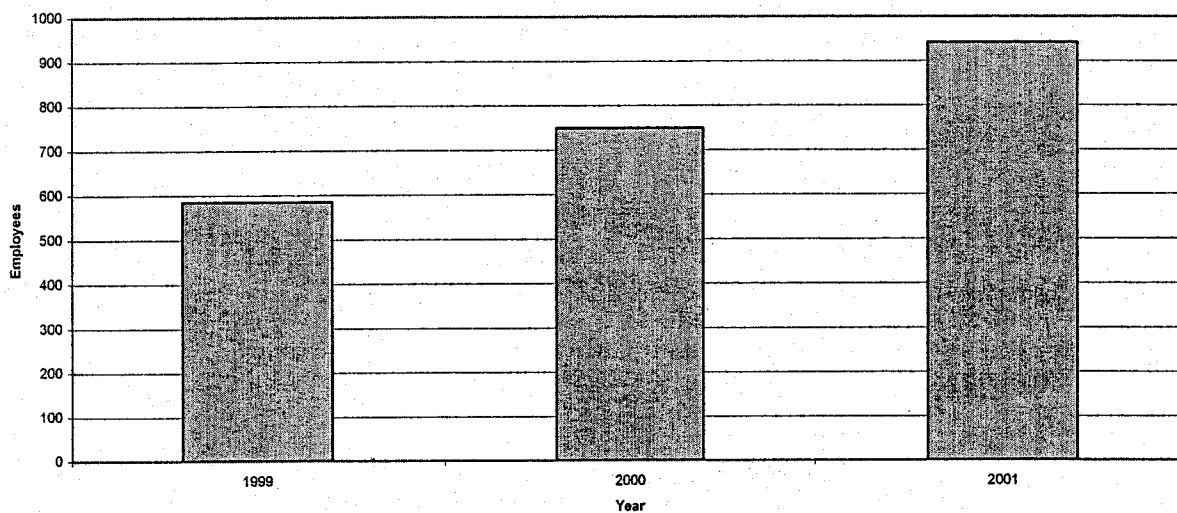
- TIC Firms 77 Employees (includes 10 students)
- ORP Firms & TIC Grads 684 Employees (includes 53 students)
- Oakdale Anchor Labs 181 Employees (includes 58 students/fellows)

942 TOTAL (includes 121 students)

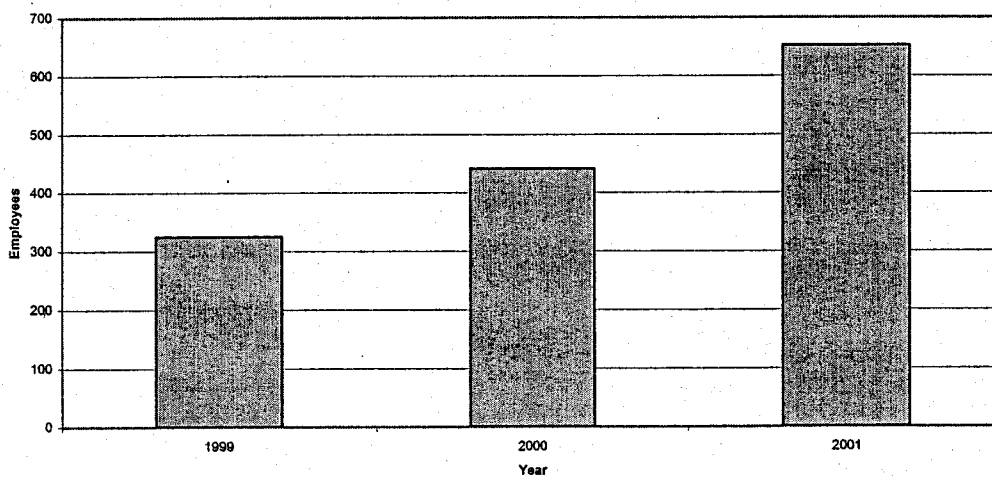
Average Full-Time Salary

- TIC Firms \$47,337 (\$34,167 for new college graduates)
- TIC Graduate Firms \$43,944 (\$35,556 for new college graduates)
- ORP Firms \$50,786 (\$40,857 for new college graduates)

**Employment Trends
All TIC/ORP Affiliates & Laboratories**



**Employment Trends
TIC Graduate Firms**



Program Activity: Intellectual Property Management

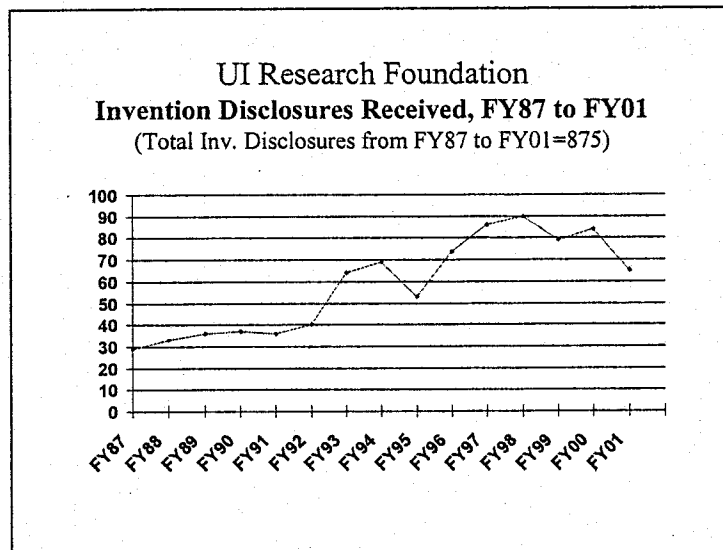
The University of Iowa Research Foundation (UIRF) is the organization responsible for managing intellectual property created at the University. It is a freestanding foundation tied to the academic mission of the institution.

- FY2001 was another productive year for intellectual property management at the University. The University of Iowa Research Foundation received 65 new invention disclosures from faculty and staff, filed 73 U.S. patent applications, received 43 issued patents, executed 31 license and option agreements, and earned \$4,496,246 in royalty and license income during FY 2001. The number of issued patents, and executed license and option agreements in FY2001 were annual record high totals. In recognition of the increased workload resulting from the growing intellectual property portfolio, the UIRF added one secretary and hired a second technology licensing assistant in FY 2001 and expected to add a third technology licensing assistant in early FY 2002.
- Details and trends are reflected in the following set of graphs covering the period from FY 1987 – 2001 and the five-year period from FY 1997 – 2001. Several technologies managed by the UIRF were identified for inclusion in this report.
- **CMV Promoter** – Among the most prominent technology transfer successes at The University of Iowa is the patented CMV Promoter for Increased Protein Expression. The significance of the CMV promoter was discovered in the laboratory of UI Mark F. Stinski, Professor of Microbiology, in his study of gene regulation mechanisms in the CMV virus. The CMV promoter has now become a very widely used tool in the biotechnology industry. It has gained importance in the commercial setting to manufacture bioengineered drugs, and may enable the development of gene therapy and DNA vaccine products. Several CMV-based drugs have received FDA approval and are currently being used to treat patients with cancer and other diseases. At the end of FY 2001, the UIRF had negotiated non-exclusive licenses with 57 industrial partners, up from 45 licenses at the end of FY 2000.
- **Coley Pharmaceutical Group** – Beginning in the mid-1990's The University of Iowa Research Foundation filed patent applications on inventions made by University of Iowa Professor of Internal Medicine, Arthur Krieg, which offer the prospect for the creation of novel therapies for the treatment and prevention of diseases by activating innate or acquired immune responses. The UIRF licensed the early discoveries in 1997, and now holds a substantial portfolio of patents and patent applications which are licensed to Coley Pharmaceutical Group, a company founded on the base UIRF technology. From this portfolio, five significant U.S. patents were awarded to the UIRF in FY 2001, including two covering fundamental aspects of Krieg's work. Coley Pharmaceuticals Group has four pharmaceuticals based on UIRF technologies that are in preclinical and clinical development for various disease indications. Currently nine clinical trials are underway, including Phase II clinical trials in the areas of cancer, asthma/allergy, and infectious diseases.

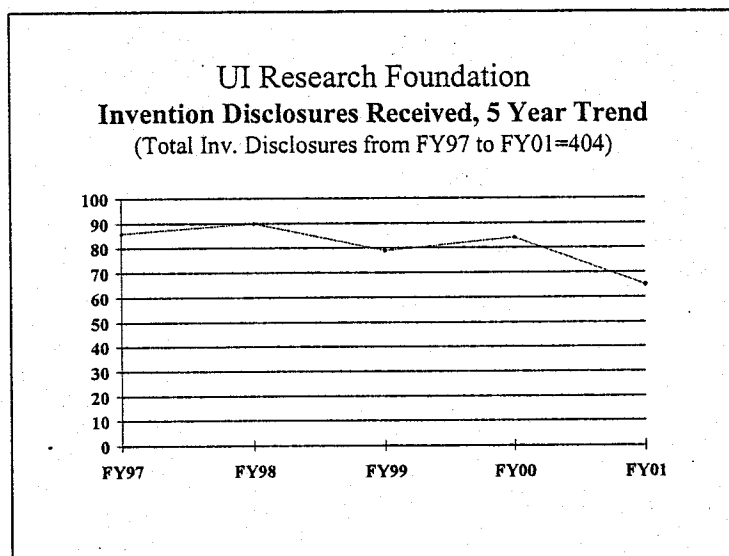
Licensure of Platform Gene Therapy Technologies – In FY 2001 The University of Iowa Research Foundation executed a license agreement with Targeted Genetics Corporation of Seattle for use of certain gene therapy platform technologies developed at the UI in the laboratory of John Engelhardt, Ph.D., UI Associate Professor of Anatomy and Cell Biology, and Internal Medicine, and Director of

the UI Center for Gene Therapy of Cystic Fibrosis and Other Genetic Diseases. The license provides Targeted Genetics Corporation with access to technological developments which may expand the use of adeno-associated virus (AAV) as a vector for delivery of genes to cells missing specific genes or containing defective genes. The technologies developed by Engelhardt and his colleagues offer the potential to overcome the size limitation imposed by a single AAV vector, and increase the efficacy by which genes are delivered from the cell surface to the cell nucleus.

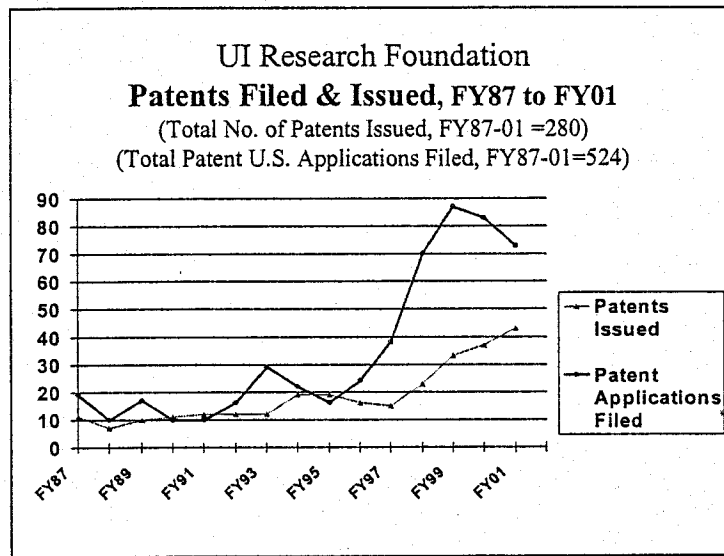
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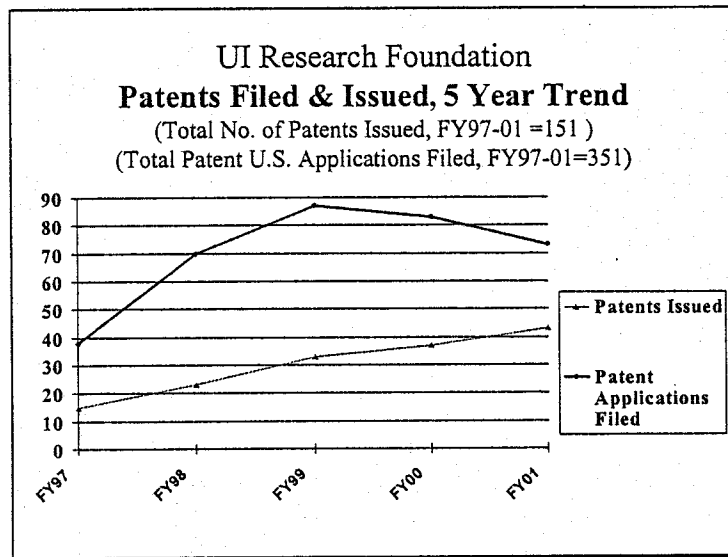
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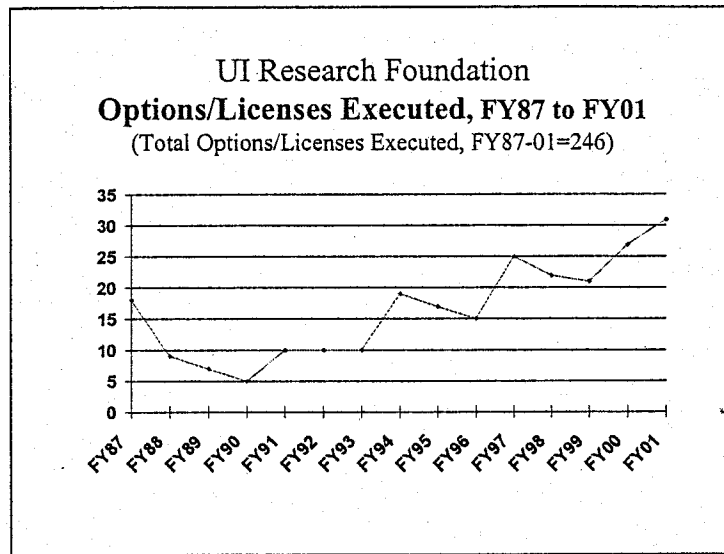
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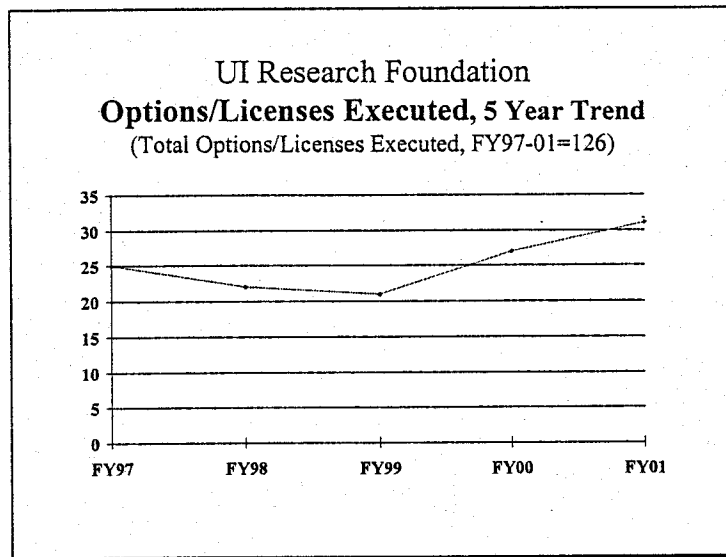
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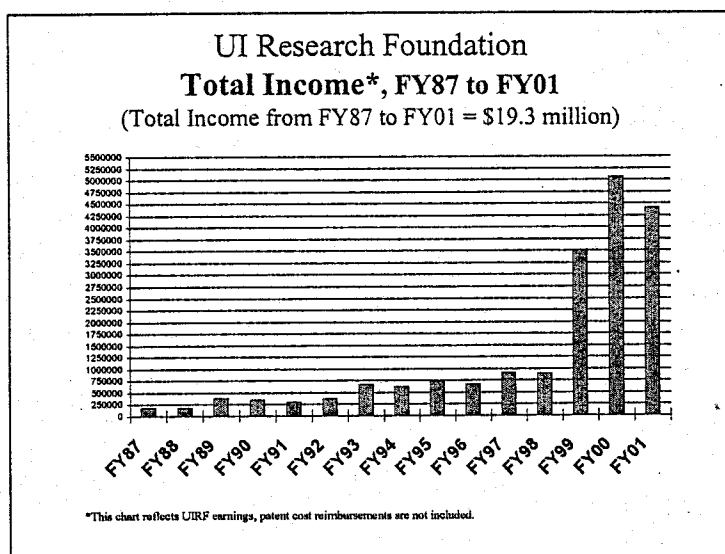
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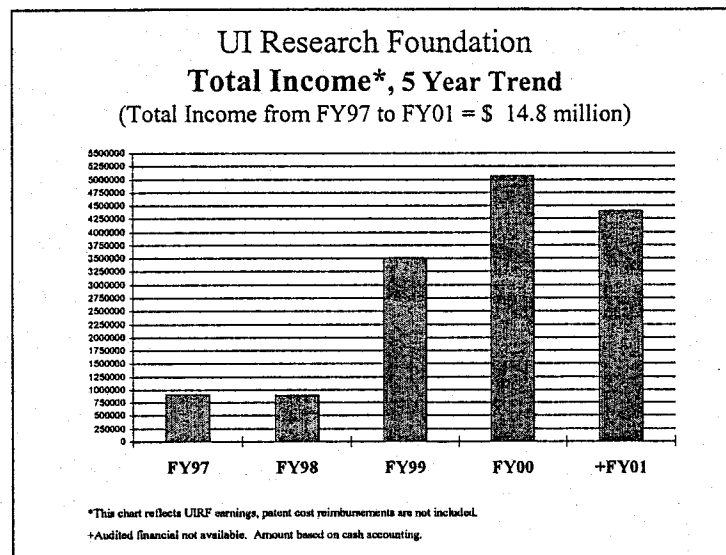
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Slide 8



Program Activity: Statewide Outreach to Iowa Corporations/Economic Development Agencies

The Office of Research Marketing & Corporate Relations (RMCR) administratively assists with strategic research initiatives to enhance research funding and technology transfer for targeted research programs; facilitates alliances with industry; showcases UI's resources and programs to external constituencies; undertakes corporate outreach to Iowa businesses; organizes campus visits for corporations and collaborates with local and regional economic development agencies and industry trade associations to jointly promote Iowa's capabilities.

As a part of these efforts, RMCR has initiated and/or facilitated discussions among a number of diverse groups (Iowa corporations, multiple UI colleges and administrative groups as well as school districts, other higher education institutions, local/regional economic development agencies and community organizations). This report about RMCR activities focuses primarily on our efforts within the State of Iowa corporate and economic development setting, along with a set of quantitative performance indicators of some of these activities.

Beginning in July 2000, RMCR initiated a statewide corporate outreach effort with a view to systematically undertake about 35 on-site visits annually to Iowa companies to match business needs with capabilities within the University of Iowa. Based on RMCR's experience with these efforts and a holistic approach to viewing the UI's role as a statewide partner in economic development, RMCR launched alliance mechanisms to bring together a larger number of (varied and multiple) constituencies to effectively address a host of complex issues in workforce training and skills development in high-tech sectors, student co-ops and internships, technology transfer, etc.

RMCR's role in facilitating such partnerships with Iowa industry and our community allows us to advance UI's tripartite missions of teaching, research and service and thereby contribute to the enhancement of Iowa's economic vitality and improve the quality of life in our community.

FY 2001 was RMCR's first full fiscal year of operation under new leadership that began in September 1999. RMCR revamped its mission, office description as well as job descriptions for RMCR personnel. This was undertaken not only to reflect institutional needs but also to organize in a way that allows us to more effectively develop and maintain our relationships with our varied internal and external constituencies and allows us the flexibility to quickly capitalize on new and emerging opportunities for funding or alliance-building. Our mission, goals and operational philosophy have been guided by and closely aligned with the UI's overall Strategic Plan 2000-2005 (titled "New Century Iowa : Bridges to the Next Horizon) as well as the VPR strategic plan.

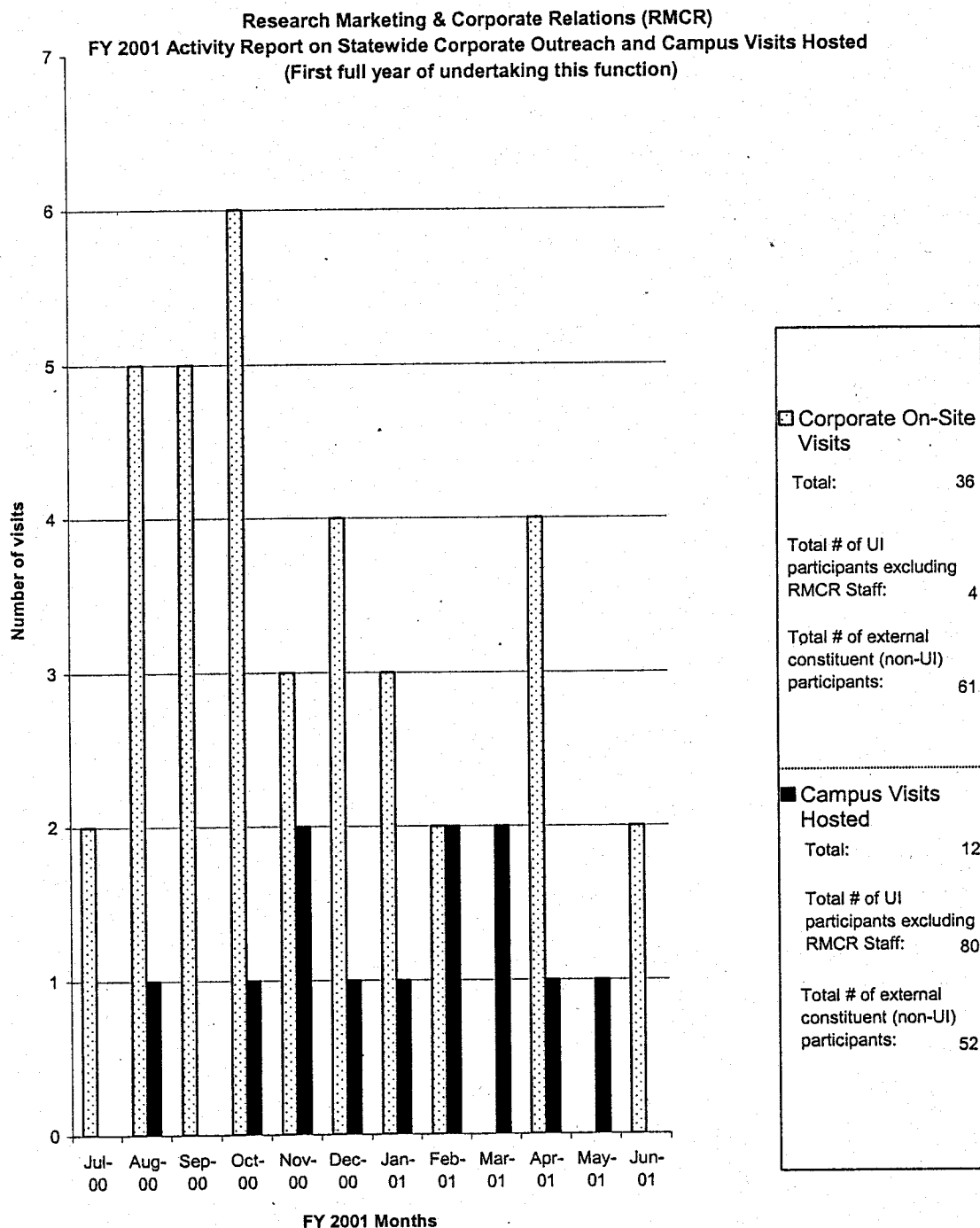
RMCR PROGRAM ACTIVITIES

Provided below is a sampling of some of our FY 2001 activities for selective inclusion (based on space constraints and overall thrust) in the report. Please note that only certain functions of the office relevant to this report are included in these sections.

PUBLICITY-BASED

Enabled publicity for UI tech transfer programs among biotech/pharma industry professionals by initial contact with editor Jeff D'Vorin of Start-up/In Vivo magazine-Windhover Inc. and subsequent publication of UI Profile in March 2001

RMCR Director delivered the keynote address at annual workshop organized by UI Career Development Services, March 2001. The focus of this presentation to Iowa Advantage students was on the desirable job skills and career management strategies required to prosper in a Knowledge-based Economy and resources available to pursue job opportunities with Iowa companies.



Operations-based

RMCR prepared desktop brochures for its office as well as a brochure featuring some of UI's bioscience research strengths relevant to prospective corporate partners. During FY 2001, RMCR hired a UI student intern from the College of Education to work on content development for our web site and the preparation of presentation slides.

Met with several administrators as well as academic centers to gain more visibility and recognition for RMCR's role on campus and to examine how RMCR can be of further assistance to several academic and administrative units. To further expand and diversify RMCR's activities and efforts on multiple levels and with varied campus units as well as the UI Foundation, RMCR Director now participates in the deliberations of the UI Collegiate External Relations Directors group, the UI Private Foundations Working Group and in periodic discussions with the UI Foundation Corporate/Foundation Relations Director and collegiate fund-raising personnel.

CONFERENCE ATTENDANCE

During FY 2001, RMCR participated in several conferences, including economic development-related events around the State. However, due to the budgetary situation, RMCR staff decided to significantly restrict out-of-state travel and conference attendance. Economic development-related events attended:

Iowa Venture Capital conference, Iowa 2010 Conference, Governor's Industry Event Program, Iowa DaVinci Conference, Advanced Manufacturing Research Cluster Collaboration (AMRCC) conference, Iowa Biotechnology Association Annual meeting, BIO 2001, Smart Economic Development Conference, Iowa Business Council Annual Dinner Reception, Quad Cities Development Group Annual Meeting and Luncheon, Priority One Annual Meeting and Luncheon, Cedar Rapids "Open for Business" Trade Show, Technology-Based Economic Development conference

STATEWIDE OUTREACH TO IOWA CORPORATIONS/ECONOMIC DEVELOPMENT AGENCIES

During FY 2001, RMCR undertook on-site visits to 36 Iowa companies and facilitated several discussions between corporate representatives as well as UI researchers, tech transfer staff, career placement officers, external relations directors and UI Foundation personnel. *A tabulated report and graph accompanies this report..*

A small sampling of projects undertaken

Each of RMCR's projects is unique given the nature/number/background of the participants and the discussion item. We have selected just a sampler for inclusion here_:

1. Workforce Development, Science Education, and Research Center Capabilities
Company: Cargill, Eddyville, Iowa

RMCR staff arranged an on-site visit to Cargill's Eddyville facility in January 2001 and met with members of their Human Resource staff and fermentation specialist supervisor to discuss a number of issues dealing with workforce development and science education. Cargill also expressed an interest in touring the UI's Center for Biocatalysis and Bioprocessing (CBB).

In March 2001, RMCR organized a follow-up meeting on campus for Cargill representatives, Iowa Biotechnology Association staff and UI faculty and staff from the following UI Colleges and/or departments:

- College of Education (Science Education Faculty) – Cargill donated fermentation equipment to the Eddyville middle and high schools. Discussion with UI's science education faculty focused on how the UI might lend support to the Eddyville science teachers in the area of fermentation curriculum development.
- Career Center & College of Engineering Career Services – Discussion focused on how Cargill could develop novel ways of getting interns and recruiting both undergraduate and graduate students. RMCR also provided Cargill with information on the UI's Women In Science & Engineering program.
- Center for Biocatalysis & Bioprocessing (CBB) – The Director of the CBB gave a tour of the facility and gave a presentation outlining CBB's capabilities.
- University of Iowa Foundation – Prospect of support for research assistantships at the CBB.

2. Quad Cities : Motion Picture Facility Planning and UI Resources of relevance to this project
Company: Two River Productions, Davenport; Quad Cities Development Group, Rock Island

RMCR put together a discussion group in response to an inquiry in November 2000 from an individual from Davenport. In January 2001, RMCR staff was invited to meet with others involved in the planning of the "Great River Studios" project including the Quad Cities Development Group (QCDG). The. As a follow-up to this discussion, RMCR hosted a meeting with UI faculty and staff and the Quad City Development Group, Two Rivers & Associates, a financier from Los Angeles and other business development consultants from the Quad Cities to discuss the proposal for the development of a film production studio facility and the potential role for UI faculty and student internships under such a project. RMCR organized a campus tour for this group in February 2001 to showcase UI faculty/staff capabilities and resources with the following participants :

- Chair of the Division of Performing Arts
- Chair of the Theatre Department
- Director of UI Video Services
- Director of Multimedia Studies division, English Department
- Tour of the Theater Building and the School of Music

3. Alliance Building, K-12 Science & Math Education &

Company: ALCOA, Davenport; Deere & Company; Moline and non-profit SECME, Atlanta, Georgia

In August 2000, RMCR Director was invited to participate in a preliminary discussion about ALCOA's interest in supporting the SECME program in the Davenport School District. Based on follow-up discussions, RMCR organized a one-day campus visit in March 2001 for ALCOA (Davenport) executives, Davenport school district superintendent and 10 science teachers, 2 program managers from SECME (a non-profit corporation in Atlanta), to showcase programs, resources and faculty in our College of Engineering and College of Education. This partnership aims to enhance math and science education in middle and high schools, particularly among under-represented minority students, to better prepare them with skills, learning experiences and motivation to enter and complete post-secondary studies in science, mathematics, engineering and technology. Participating UI colleagues were :

College of Engineering : Associate Dean, External Relations Director, Engineering Minority Student Scholarship

Office of the Provost : Staff of Opportunity at Iowa

College of Education : Associate Dean and two faculty

Women in Science & Engineering program

RMCR continues to be involved in this initiative and has attended subsequent meetings in the Davenport School District along with faculty from the College of Engineering, College of Education and staff from Opportunity at Iowa.

4. Internships, Minority Hiring, Diversity in the workforce

Company: Monsanto Corporation, Muscatine

In December 2000, RMCR Assistant Director visited Monsanto Corporation in Muscatine, toured their facility and met with members of their Human Resources division. Monsanto's staff asked RMCR to help facilitate a campus visit to meet with UI faculty/staff to discuss internships, Monsanto's minority engineering scholarship programs, and to learn more about UI minority student associations. In January 2001, RMCR hosted Monsanto on campus and set up meetings to address the above-mentioned issues with the following UI faculty and staff group :

- Career Center Director and Assistant Director for Internships and Co-ops
- Staff from Women in Science and Engineering (WISE) program
- Staff from UI College of Engineering for Minority Student scholarships
- Director of UI Student Services
- Faculty who serves as the President of Minority Engineering Student Association (MESA)
- Tour of the UI College of Engineering and meeting with Engineering group to discuss internships, co-ops and student placements specifically in the engineering fields.

As a result of this meeting, Monsanto was able to increase its pool of engineering candidates eligible for their minority scholarship program and establish key contacts for both undergraduate and graduate internships and graduate placement.

5. Biocatalysis & Contract Manufacturing

Company: Penford Corporation, Cedar Rapids

In fiscal year 2000, RMCR met with members of the Cedar Rapids Chamber of Commerce and Priority One. At that meeting, RMCR was informed about Penford Corporation's new R&D division. In November, RMCR organized an on-site visit for Professor Jack Rosazza, Director of the Center for Biocatalysis and Bioprocessing. Dr. Rosazza presented CBB capabilities to fifteen members of their R&D staff.

As a follow-up to this visit, RMCR staff facilitated a meeting with Penford's R&D staff and UI faculty members to discuss possible areas of collaboration in the area of new business development. These meetings involved faculty and staff members from the Center for Biocatalysis and Bioprocessing, Bioprocessing Byproducts Consortium, and University of Iowa Research Foundation. The meeting was held at the CBB and guests were given an overview and tour of the facility.

6. MBA Student Project

Company: Kind & Knox Gelatine, Inc., Sergeant Bluff

In February 2000, RMCR assisted Kind & Knox Gelatine in finding an MBA student through the UI College of Business Summer Internships program to work on a market analysis project. Over the

summer, RMCR kept in contact with the corporate executive to see how the project was progressing. In the fall of 2000, RMCR Assistant Director made a follow-up courtesy visit to the company and learned that company was pleased with the results of the marketing project. During this trip, RMCR staff also visited a number of other companies in the Sioux City/Sioux Center area.

State agency contact-related

As part of the Board of Regents office's effort to increase awareness for and the accessibility to resources and expertise existing at the Regents institutions, RMCR now participates in outreach presentations in conjunction with ISU and UNI. Two such presentations were undertaken in FY 2001 along with colleagues from ISU and UNI – one to the IDED Board and one at the Annual meeting of the Professional Developers of Iowa in Council Bluffs. The slide presentation used at these events was developed to be consistent with the UI President's overall institutional core message. (RMCR Director had earlier participated in the development of this institutional core message.)

Workforce Development-related projects

RMCR organized a one-day campus visit for ALCOA (Davenport) executives, Davenport school district superintendent and science teachers, program managers from SECME (a non-profit corporation in Atlanta), to showcase programs, resources and faculty in our College of Engineering and College of Education. This partnership aims to enhance math and science education in middle and high schools, particularly among under-represented minority students, to better prepare them with skills, learning experiences and motivation to enter and complete post-secondary studies in science, mathematics, engineering and technology.

RMCR initiated discussions with a UI department chair and the UI Career Development office to discuss the establishment of internships with Iowa life science companies to enhance students' learning experiences and work skills in these sectors.

RMCR hosted a meeting with UI faculty and staff and the Quad City Development Group, Two Rivers & Associates, a financier from Los Angeles and other business development consultants from the Quad Cities to discuss a proposal for the development of a film production studio facility and the potential role for UI faculty and student internships under such a project. RMCR organized a campus tour for this group to showcase resources within our Division of Performing Arts, and our facilities in the Theater Building and the School of Music.

State agency contact-related

At the request of the Governor's office, IDED and/or the Board of Regents office, RMCR organized a campus visit for two venture capital groups and a corporate executive from a French biotechnology company.

RMCR hosted a campus visit for CJ Niles, the new director of the IDED.

RMCR staff continue to represent the UI at Governor Vilsack's HRRC Alumni receptions. RMCR staff participated in discussions on ways to enhance the HRRC's Spring Break Program and publicize success stories. Fifteen UI students participated in this year's program.

RMCR Director was appointed to the Iowa Economic Development Board in May 2001 and to the State SBDC Advisory Board in January 2001.

RMCR Assistant Director serves on the Advisory Boards of the IDED Human Resource Recruitment Consortium and Iowa Rural Development Council.

RMCR PERFORMANCE INDICATORS

Given RMCR's mission and objectives, we provide below ONLY THOSE readily quantifiable indicators that seem meaningful to track on a regular basis for external reporting purposes.

These numbers cannot however capture the essence or comprehensive sense of the activities undertaken by a small but energetic 3-person team including the Director, Assistant Director and a secretary with limited resources. We would like to emphasize here that many of RMCR's strategic or relationship-building functions, outlined below under items 1 through 8 are not meaningfully quantifiable, i.e., for noticing trends over a period of time for planning or performance assessment purposes, and therefore we have decided not to even attempt to quantify such functions for external reporting purposes. Such activities include but are not limited to the following :

1. Participation in strategic research initiatives (eg. RMCR Director serves as a member of the UI Informatics Study Committee)
2. Time involved in the coordination and development of new materials or brochures or "talking points" and "opinion pieces" or other matters specifically undertaken from time to time at the request of the President or the Vice President for Research.
3. Time and effort involved in the identification, development and facilitation of new interdisciplinary projects which have the potential to garner funding from new and emerging research sponsors
4. Time or effort spent on responding to individual or corporate inquiries or requests for information/materials or referrals on UI programs
5. Interactions or meetings with UI staff or researchers during which no external constituent participated, eg., regular, periodic meetings with various internal constituencies
6. Travel, background preparation or overnight stay time involved in undertaking statewide on-site corporate visits or for participation in State Boards and commissions
7. Participation at a host of events and receptions to represent the Office of the Vice President for Research or the President as designates, or to heighten the visibility for UI.
8. Time or effort spent on routine project facilitation or coordination among large number of internal UI participants.

Participation in Type of Activity (categorized by the intensity of involvement by RMCR staff)	Number of UI participants (excluding RMCR Staff)	Number of external constituent (non-UI) participants	Number reported for FY 2001
On-site corporate visits to Iowa companies	4	61	36
Campus visits hosted by RMCR	80	52	12
Campus visits that RMCR helped organize	N.A.	N.A.	6
Campus/external visits that RMCR participated in (excl. conferences attended)	N.A.	N.A.	20

Program Activity: Specially Supported Programs for Technology Transfer, Economic Development, and Workforce Development

As called for in an earlier strategic plan, the State has supported the establishment of three anchor laboratories on the UI Oakdale Research Park and Oakdale Research Campus. They are the Center for Advanced Drug Development, the Center for Biocatalysis and Bioprocessing, and the National Advanced Driving Simulator. Descriptions of these programs, along with a summary of their FY 2001 activities, are provided in the following appendix to this report.

Collaborations/Partnerships/Services

- The Office of Research Marketing and Corporate Relations joined with the Oakdale Research Park to co-sponsor the UI participation in the annual Biotechnology Industry Organization (BIO) Conference in Seattle. Research Marketing staff attended the BIO Conference. The UI participation was a collaborative effort with the Iowa Department of Economic Development, Iowa State University, University of Northern Iowa, and the Iowa Biotechnology Association.
- Center for Biocatalysis and Bioprocessing staff serve on State Life Sciences initiative committees to establish a cGMP protein processing facility for the State of Iowa.
- The Office of Research Marketing and Corporate Relations joined with the UI College of Engineering and the ISU College of Engineering to co-sponsor an exhibit at the Advanced Manufacturing Research Collaboration Cluster (AMRCC) conference.
- The Office of Research Marketing and Corporate Relations catalyzed unique connections with some of Iowa's community colleges, particularly between Kirkwood Community College and UI Office of International Programs.

- NADS, jointly with the VRAC (Virtual Reality Applications Center) at Iowa State University, is pursuing advanced simulator networking research for vehicle and equipment distributed product design. This project is aimed at linking, through the ICN, VRAC and NADS with industrial quality, agricultural equipment design test cases that will be provided by Deere & Company.
- The UI, led by the Office of Research Marketing and Corporate Relations, assisted Iowa State University's CATD in presenting an SBIR/STTR conference for Iowa City area technology companies.
- The Office of Research Marketing and Corporate Relations facilitated a meeting with University of Iowa Research Foundation staff, UI College of Engineering researchers, and the Director of the Iowa Energy Center-Ames. The meeting was requested by IEC to encourage submission of grant applications to the IEC.

Performance Indicators

Board of Regents Indicators

- 65 invention disclosures were received by the UIRF in FY 2001
- 18 new technologies were licensed by the UIRF in FY 2001
- 14 new licenses generated revenue to the UIRF in FY 2001
- \$4,496,246 in total royalty and license fee income was earned by the UIRF in FY 2001

Other Indicators Unique to the University of Iowa

See trends reported in the University of Iowa Research Foundation section of this report.

APPENDIX

CONTENTS

- Center for Advanced Drug Development
- Center for Biocatalysis and Bioprocessing
- National Advanced Driving Simulator
- Oakdale Research Park
- Research Marketing and Corporate Relations
- Technology Innovation Center
- University of Iowa Research Foundation

Appendix: University of Iowa Technology Transfer Offices and Anchor Centers

As noted in the body of the report, the UI maintains four offices which have responsibilities for technology transfer interactions with the business community. Consistent with strategic planning, a set of "anchor centers" was established at Oakdale. Descriptions of these offices and centers are provided here.

The Center for Advanced Drug Development (CADD)

Definition

The Center for Advanced Drug Development (CADD), established in 1992, is located on the University of Iowa Oakdale Research Campus and employs 18 full-time employees, one graduate student, and six undergraduate students.

CADD operates under the umbrella of the University of Iowa College of Pharmacy and its staff works in close collaboration with the faculty of the College. CADD has the capability to engage in the full range of the drug development process by calling upon the resources of the UI College of Pharmacy's Division of Pharmaceutical Service (PS), the Center for Biocatalysis and Bioprocessing and the Iowa Drug Information Network.

Collectively this expertise offers a unique Research and Development partnership with the Pharmaceutical and Biotechnology industry. The Center offers an excellent resource to enhance technology transfer and attract/develop new industry to Iowa. Outsourcing to CADD allows our clients to shorten the lead time between new pharmaceutical discoveries in the laboratory and their communication in the marketplace.

Scope

The Center's services are geared to benefit the following types of clients:

- Small or medium-sized pharmaceutical companies which do not typically have an extensive scientific staff or facilities to perform the studies CADD provides.
- Veterinary pharmaceutical companies
- Biotechnology companies
- Large pharmaceutical companies which periodically lack the capacity to pursue all projects internally
- Medical departments that require stability studies on new drugs or drug products under investigation
- International pharmaceutical companies that seek to market a drug in the United States
- Governmental agencies

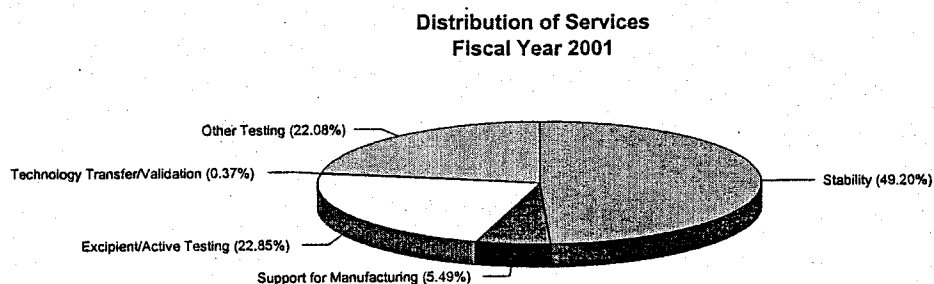
Relationship with University of Iowa, College of Pharmacy

The Center offers contract services which complement those of the College of Pharmacy's Division of Pharmaceutical Service. More particularly, the Center offers non-production services relevant to the clinical trials process. Services include: management of FDA relationships for client firms (especially in the processing of new drug applications), development and execution of new chemical assays for candidate new dosage forms and new chemical entities, technical transfer or validation of assay methods, development and execution of stability studies of dosage forms, and testing of active pharmaceutical ingredients/excipients for compliance.

Through the Division of Pharmaceutical Service, the UI College of Pharmacy offers the special capacity to produce under contract limited quantities of new medicines under FDA approval and utilizing an FDA registered facility (the only such comprehensive facility in a College of Pharmacy in the U.S.). The capacity is particularly valuable to firms wishing to bring new products through clinical trials. The close collaboration between PS and CADD is demonstrated by the fact that 20% of the FY 2001 projects were of a joint nature. CADD also performs active pharmaceutical ingredient/excipient testing following official testing procedures for PS and outside clients. This service returned revenues of \$100,000 during FY 2001. Contracted technology transfers and validations contributed \$87,000 in receivables.

Relationship with Iowa, National and International Industry

The 2001 client base, which contracted 429 projects with CADD, included four companies from Iowa (two pharmaceutical/veterinary companies, one excipient manufacturing company, and one contract testing facility), nine companies from surrounding Midwestern states, 16 companies from elsewhere in the USA, and one company from Europe.



CADD has provided employment to four Iowans whose employer relocated its Cedar Rapids chemistry laboratory out-of-state. It has also employed four Iowans who were looking for better career opportunities in the analytical sciences field.

Involvement in Education

Undergraduate Students:

In response to the University of Iowa's goal to create an undergraduate experience that enables students to fulfill their intellectual, social, and career objectives;

CADD exposes undergraduate student employees in the sciences to current Good Manufacturing Practices and current Good Laboratory Practices (cGMP/cGLP). cGMP/cGLP experience is a sought-after skill in the pharmaceutical industry or any FDA compliant laboratory.

Graduate Students:

One of the goals of the College of Pharmacy and the UI graduate and professional programs is to achieve premier recognition in a significant number of areas.

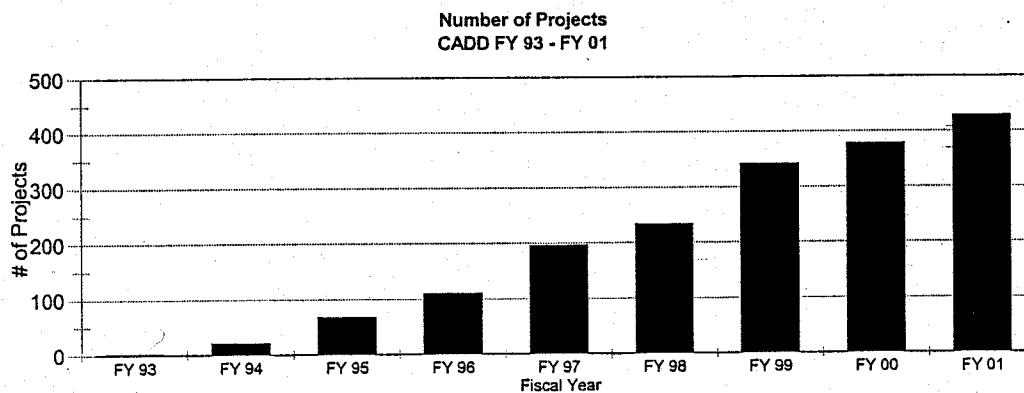
In this effort, CADD employs graduate students to assist in client research and to perform routine assays. Graduate students are trained to follow cGLP/cGMP and their notebooks are reviewed by the Quality Assurance Unit. Upon leaving CADD, they are well-versed in cGLP/cGMP.

Graduate students have also presented results of research as posters at international professional association conferences.

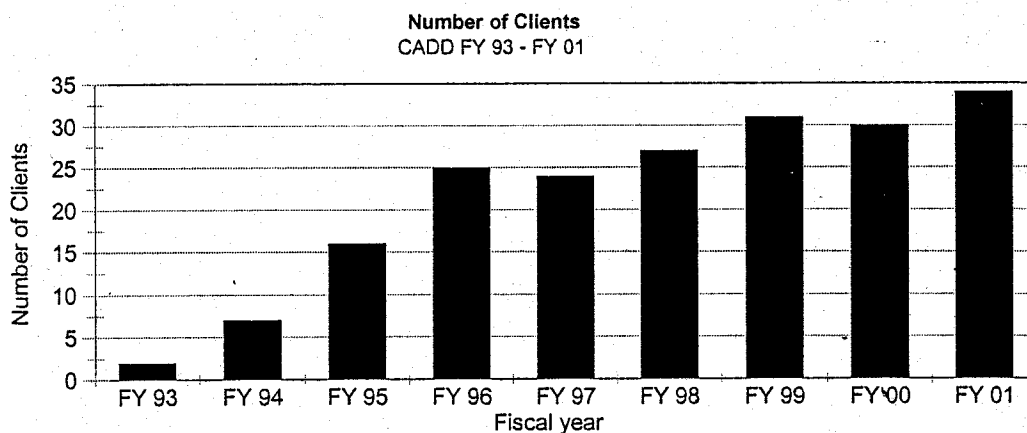
Accomplishment of Goals

The following charts reflect CADD's accomplishment of internal goals:

- (i) increasing the client base,

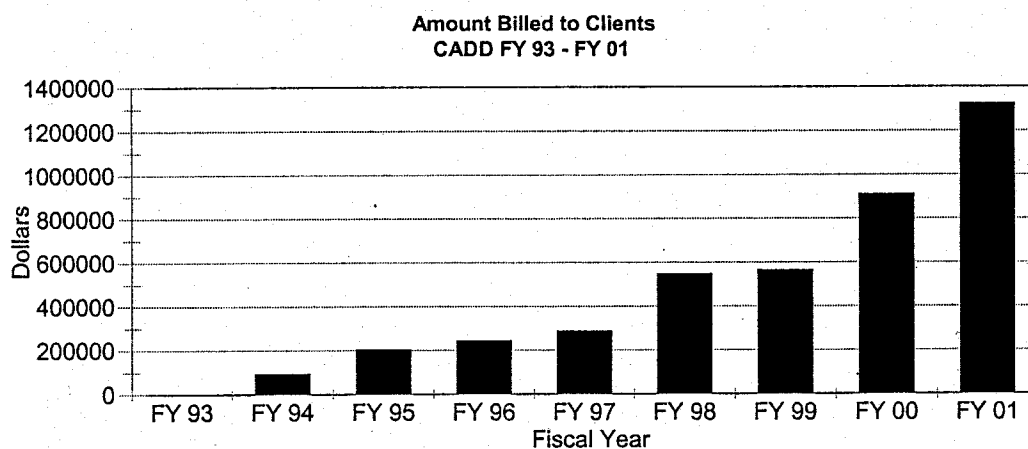


- (ii) increasing the number of projects contracted,



and

(iii) being self-sufficient.



Other Accomplishments

remodeled 4300 additional square feet since its inception in 1992 and occupies a total space of 5825 square feet

in accordance with FDA regulations, added a Microsoft NT local area network and other scientific related software to maintain security of client data and efficient report generation

presented nine research posters at five international meetings

worked with a total of 58 local, national, and international clients

added an in-house quality assurance program which is current Good Laboratory Practices (cGLP) and Good Manufacturing practices (cGMP) compliant

marketed the joint capabilities of CADD and the Division of Pharmaceutical Service by exhibiting at annual meetings of the national American Association of Pharmaceutical Scientists'

developed an Internet home page to reflect new capabilities to current clients and information to prospective clients

strived to update instrumentation and software to offer unique services

For additional information please contact: <http://www.uiowa.edu/~cadd>, e-mail Dr. Alta Botha, Laboratory Director, alta-botha@uiowa.edu, or phone 319-335-4096.

The Center for Biocatalysis and Bioprocessing (CBB)

The CBB is a multidisciplinary research group with a primary focus on biocatalysis and bioprocessing. Consisting of 55 faculty members and over 300 researchers from seven different university departments, the group is widely regarded as the best in the nation in this specialty area.

The Center's national prominence is clear from the receipt of more than 2.2 million in highly competitive biotechnology training grants from the National Science Foundation and the National Institutes of Health. UI researchers associated with the Center attracted more than \$ 15 million in federal and corporate research support in FY2001 giving further strong evidence of the competitive standing of the group.

The CBB Laboratory in the UI Oakdale Research Park continues to expand collaborative efforts with industry. Enabled by special appropriations from the State of Iowa, the Center completed the installation of necessary equipment, and assembled an experienced staff. The unsurpassed facility consists of highly-instrumented fermentors ranging from 2 - 1000 liters working capacity plus downstream processing and analytical equipment. The laboratory operates on a Good Laboratory Practices standard, essential for interactions with biotechnology industry.

The CBB conducts industrial biotechnology research by developing, optimizing and scaling up fermentation processes, recovers valuable fermentation products, and provides other contract services. The laboratory grows and processes "recombinant" bacteria, yeasts and filamentous fungi.

During the past two years, the CBB helped more than 50 companies develop new products and refine processes. Many of these companies are linked to the state of Iowa. CBB-industry projects have included production of food and feed ingredients, industrial process and diagnostic enzymes, pure peptides as drugs, vaccines, pathogens for medical research, new steroid hormone derivatives, recombinant proteins, specific oxidases, and bacterial and yeast cells.

The Center's outreach programs include a 10th annual conference to be held in October 2001. Scientists from more than 28 nations and 28 states have visited Iowa in connection with this conference. In addition, CBB staff currently serve on Life Sciences initiative committees to establish a cGMP protein processing facility for the state of Iowa.

The CBB's laboratory facilities are also used by biotechnology-related, start-up companies

through the UI Technology Innovation Center (TIC). Albany Molecular Inc. is leasing space and equipment within the CBB Laboratory, and they have expanded their presence in the Oakdale Research Park as they evolve to 50 scientists working in Biocatalysis. A second firm, Apovia from San Diego, has worked closely with the CBB to develop vaccines for early clinical trial. Apovia has moved cGMP processing facilities to the Research Park.

DuPont Update - In FY 2001, the CBB continued technology development for industrial licensing and use on a series of patents donated to the University of Iowa Research Foundation (UIRF) by DuPont in FY 1999. The intellectual property involves a recombinant yeast and other organisms that produce an enzyme commonly found in spinach. This spinach enzyme, Glycolate Oxidase (GO), converts α -hydroxy acids, like lactic acid, to α -keto acids. This conversion is important in the production of specialty chemicals, pharmaceutical intermediates and food ingredients. Based on direction from an advisory committee of faculty scientists and with funding support from the UIRF and the CBB, the CBB successfully expressed the recombinant enzyme in high titers, established parameters for efficiently converting lactic acid to pyruvic acid, and have developed the process to pilot scale. The CBB continues to work with DuPont scientists in establishing the reaction and recovering products in the CBB Fermentation laboratory.

Bioremediating Explosives Waste

As a result of processing, Army Ammunition Plants (AAPs) generate "Pink Water", a wastewater contaminated with TNT, RDX and HMX. Because of toxicity, environmental agencies apply stringent standards for release of these compounds. The preferred treatment technology passes Pink Water through granular activated carbon (GAC) columns. TNT, RDX and HMX adsorb onto the GAC, but then the GAC becomes a hazardous waste. The U. S. Army sought a biological treatment process to regenerate these columns in situ by degrading the adsorbed compounds. The concept involved minor modification to the GAC columns to turn them into bioreactors.

Previous work isolated and cultured organisms from explosives-contaminated soils to select thermophilic organisms capable of degrading TNT. The University of Iowa's Center for Biocatalysis and Bioprocessing (CBB):

1. examined organism viability and effectiveness
2. determined chemical fate of degrading TNT,
3. found optimal conditions for TNT destruction,
4. developed protocols for growth, processing, and shipment, and
5. provided inoculum for pilot-scale testing.

Then, CBB developed conditions to treat the more recalcitrant RDX and HMX compounds. Pilot scale testing at Milan TN AAP and Middletown IA AAP demonstrated destruction efficiencies in excess of 99%, significantly exceeding the 90% goal. Full scale tests at Iowa AAP are under discussion.

National Advanced Driving Simulator

The National Advanced Driving Simulator (NADS) is one of four "anchor centers" on the Oakdale Research Campus. NADS is a joint project of the Department of Transportation, the State of Iowa and The University of Iowa. When complete in the fall of 2001, NADS will be an internationally unique, and the most advanced, motor vehicle simulator for conducting human-centered driving safety research in a highly re-configurable computer generated environment. The primary mission for NADS is to conduct and support NADS-based research to assist the National Highway Traffic Safety Administration (NHTSA) of the Department of Transportation in obtaining fundamental understanding of cause and effect during routine and critical crash avoidance maneuvers, determining the limits of operator performance, improving vehicle design and highway systems that will significantly enhance the driving safety. A second mission is to conduct vehicle system engineering research with government and industry to enhance the productivity of the automotive manufacturing sector.

NADS staff is supporting two research projects of national significance that have been included in NHTSA's plan for experiments using the NADS in FY 2001 and 2002. The first project will study the effects of blood alcohol content on driving performance and the second will study the effects on safety when drivers use, for example, cell phones, on-board computers, internet services, e-mail, faxes, and navigational devices. These two projects are also examples that can only be conducted safely, repeatedly and under controlled conditions in the simulator. NADS staff is also working diligently to develop enabling technology for users from the automotive, agriculture, construction, and military sectors as well as medical community, and to attract users to use the Simulator.

NADS, jointly with the VRAC (Virtual Reality Applications Center) at Iowa State University, is pursuing advanced simulator networking research for vehicle and equipment distributed product design. This project aims at linking, through the ICN, VRAC and NADS with industrial quality, agricultural equipment design test cases that will be provided by Deere & Company. Benefits and challenges of networking of VRAC and NADS environments are being studied. This project will also enable the engineers to gain unique insight into the operation of the vehicle under realistic operating conditions, and to identify challenges and opportunities in information technology that are critical to the networking of operator-in-the-loop simulator environments and virtual reality – an area which holds potential for economic development in the state.

NADS currently employs 45 highly qualified staff and has approximately 20 students working in a multi-disciplinary research and development environment.

Oakdale Research Park

The University's Oakdale Research Park was established in 1989. It is an important way in which the University works to attract firms to the State. The Park offers leased building sites and space to businesses engaged in basic and developmental research, product development, and light manufacturing linked to research and development activities. By locating on the Park, companies requiring a sustained relationship with the University will benefit from their proximity to its research resources including faculty expertise, specialized equipment, and laboratory facilities.

The University encourages interaction between its faculty members and corporate tenants on the Park as a means of promoting both corporate and University research and the transfer of technology to and from the laboratory and the marketplace. "Anchor centers" sited at Oakdale are devoted to pharmaceutical development, industrial biotechnology, human health and medicine, and driving simulation.

The Oakdale Research Park is especially well-suited to accommodate the expansion needs of growing companies emerging from the University's Technology Innovation Center (business incubator).

Twenty lots on the 189-acre Park are available for lease and development. Seven projects on the Park include the Multi-Tenant Facility, which houses anchor laboratories for biotechnology and medicine, the LMS CADSI corporate headquarters, the Stockpoint, Inc. (formerly Neural Applications Corp.) headquarters, the Oakdale Systems, Inc. headquarters, the National Advanced Driving Simulator, the four-building Myriad Technology Plaza (which houses The Stanley Group, Ascend Technologies, Police Law Institute, Breakthrough to Literacy, Inc., and the Biocatalysis Division of Albany Molecular Research, Inc.), and Phase I of the Corridor Technology Center which was under construction in FY 2001 and will welcome NCS Pearson as anchor tenant in FY 2002.

In FY 2001 Albany Molecular Research, Inc. (AMRI) completed construction of a \$3.5 million laboratory that enabled the AMRI Biocatalysis Division (formerly UI spin-off company EnzyMed, Inc.) to expand in the privately-owned Myriad Technology Plaza on the Park. In late FY 2001, the University neared completion of a major expansion of the Multi-Tenant Facility laboratory complex. When the project is completed in FY 2002, it will add a 14,000 square foot laboratory and auxiliary space to accommodate rapidly growing research activities of the Department of Ophthalmology. The \$5.5 million project will be funded by corporate research grants won by UI investigators. The University is also constructing another 14,000 square foot addition that will provide speculative shell space for future build-out when funding is identified to provide much-needed wet laboratories for biotech "incubator" companies. Following the University's \$1 million investment in the building shell, the Iowa Department of Economic Development agreed to accept the Park as recipient of a \$500,000 Advanced Research Commercialization award to construct laboratories for incubator companies in part of the new building shell. The laboratory construction was expected to be completed in FY 2002.

Research Marketing and Corporate Relations

MISSION

The Office of Research Marketing & Corporate Relations (RMCR) acts primarily as a research-related university-corporate interface for the University of Iowa (UI) and reports to the Vice President for Research. RMCR advances UI's research, teaching and service missions by facilitating university-industry partnerships.

RMCR's broadly defined mission is to enhance research funding and technology transfer. RMCR promotes UI programs among corporate and other constituencies to better position the UI at the local, national and international levels. RMCR seeks to synergize efforts among various internal and external parties to help attain larger UI institutional goals in an increasingly dynamic, interdependent, global environment.

OBJECTIVES

RMCR works with faculty, staff, academic centers and administrative units and the UI Foundation:

- To foster and facilitate cutting-edge, research-intensive alliances with corporations and leverage various sources of funding for selected research programs.
- To undertake outreach to Iowa corporations to match their business needs with capabilities within the UI.
- To represent and showcase UI programs, capabilities and expertise to external constituencies through participation at conferences.

ACTIVITIES

In addition to advising and assisting the VPR on several strategic initiatives, RMCR staff undertakes the following activities:

- Facilitates faculty/staff meetings with potential corporate partners and other alliance partners
- Undertakes corporate outreach through on-site visits to Iowa companies
- Organizes campus visits by corporations and State economic development agency personnel
- Builds and strengthens relationships with industry partners, scientific collaborators and other potential sponsors through active networking
- Showcases UI research strengths and technology transfer programs
- Responds to external inquiries relating to ongoing research projects, licensable technologies, student internship opportunities, UI speakers, continuing education, and other matters

To further UI's contribution to Iowa's economic vitality, RMCR supports several State initiatives in the high-technology sector and collaborates with local and regional economic development agencies to jointly promote Iowa's capabilities. RMCR staff serve on several Boards of economic development and community service organizations.

Technology Innovation Center

The Technology Innovation Center (TIC) was established in 1984 to foster the development of new technology-based business ventures. The center provides cost-effective office and laboratory space, access to shared office equipment and facilities, and assistance in establishing relationships with the University. Those relationships may include research sponsorship or collaboration, student or graduate employment, faculty consulting, and licensing of intellectual property. The center offers ready access to the University's computing facilities, research equipment and instruments, as well as advisory services on management, marketing, and finance.

Since its inception, the center has attracted approximately 60 companies created from the business strengths of Iowa, spin-off companies from research work at the University, and new research and development units of existing companies. Companies stay at the center for a limited time. Currently, 15 companies in residence at the center are preparing products and services in a broad range of fields, including:

- Information visualization
- Patient education software
- Drug discovery
- Interactive teleconference delivery
- Diagnostic assays for parasitic disease
- Dynamic image analysis
- Environmental engineering software
- Internet communications
- Optimization software development
- Antibacterial therapeutics
- Hazardous chemical detection
- Greenhouse gas emission validation

Seventeen "graduate" companies achieved their business goals after leaving the center.

The University of Iowa Research Foundation (UIRF)

The University of Iowa Research Foundation was established in 1975 as a free-standing nonprofit corporation to manage inventions and intellectual property created at the UI. It does so by selectively obtaining patent or copyright protection for UI inventions or discoveries and by licensing these inventions to business and industry. Policy decisions for the UIRF are determined by a Board of Directors, selected from UI faculty and staff, members of the State Board of Regents, officers and directors of The University of Iowa Foundation and the public.

Objectives of the UIRF

Since 1987, the UIRF has been granted 280 patents. Specific objectives of the UIRF are to:

- Educate the UI community about issues concerning the protection of intellectual property
- Identify research with potential to produce new and useful knowledge which could be commercialized for the public benefit
- Disseminate new and useful knowledge resulting from University research through the use of the patent system
- Market patented technologies as well as those technologies being considered for patenting
- License patents to industry in order to promote the development and commercialization of inventions

- Assure that patent-related obligations to outside research sponsors and funding agencies are met

Patent Policy

To encourage and assist the University inventor in the use of the patent system in a manner that is equitable to all parties, the Board of Regents approved the University of Iowa Patent Policy. This policy requires that all faculty, staff, employees and students disclose to the UIRF all ideas, inventions or discoveries conceived or made during their employment or association with the University while using University time, materials or facilities. UIRF staff then determines what rights, if any, the University or any of its sponsors has to the idea, invention or discovery. With the UI Patent Committee as its advisor, the UIRF evaluates the invention and decides whether or not to pursue it further, based on these criteria: its patentability; its benefit to the public; its commercial potential; its scientific soundness and value; and its benefit to the University.

Licensing of Inventions to Industry

The purpose of licensing inventions to industry is twofold: (1) to provide a mechanism for transferring the results of University research to the public for the public benefit, and (2) to generate income for education and research. Net proceeds from licensing income are shared between the inventor and the University in accordance with the University of Iowa Patent Policy. Licensing activity may begin any time following disclosure and need not be delayed to allow a patent to issue. To ensure confidentiality and protection of non-patented technologies, an agreement is co-signed by the UIRF and the potential licensee prior to release of specific information about the invention. The UIRF maintains a summary of all patented and licensable technologies and distributes this information to the business community.